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Does a Governor's Gender and Political Party Affect a State's GDP Growth during the COVID-19 Pandemic?¹

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Abstract:

In a vacuum of federal policies during the COVID crisis, U.S. state governors who were female and/or Democrats were more likely to enact public health policies that reduced COVID deaths. Using 2005–2020 quarterly data, we test whether states with female and Democratic governors experienced lower GDP growth rates during COVID. We find that states with Democratic governors experienced annual GDP growth two percentage points lower than states with Republican governors in 2020, with statistically weaker results for female governors. The two-point reduction in GDP growth is less than the economic value of estimated lives saved due to these policies.

Key Words: Covid, Governors, Female Leadership

JEL CODES: (H12, H70, H75)

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The COVID-19 pandemic has been a major health crisis, causing over 1.81 million deaths globally and over 330,000 deaths in the United States in 2020. The pandemic has also created an economic crisis, plunging the economies of both the world and the United States into a recession. On the public health side, the effectiveness of female national leadership has been on display during the COVID-19 pandemic: Countries under female leadership have a slight “edge over countries led by men... controlling the spread of COVID-19” (Purkayastha, Salvatore, & Mukherjee, 2020), resulting in fewer deaths (Wittenberg-Cox, 2020). At the subnational level, U.S. states with female governors have had lower death rates from COVID-19 than those led by males (Crist, 2020).

Social distancing measures may have short-term negative economic consequences and result in lower economic growth rates. Female and Democratic governors were stricter in their social distancing policies (Sergent & Stajkovic, 2020; Baccini & Brodeur, 2020). Female governors also had more success with stay-at-home orders, in terms of lower COVID-19 death rates, compared to male governors (Sergent & Stajkovic, 2020; Crist, 2020). Similarly, Democratic governors were “50% more likely to implement stay-at-home orders,” and all Democratic governors enforced stay-at-home orders in their state at some point (Ballotpedia, 2021). The pandemic has brought to light the fact that “Democratic governors place a special emphasis on health and safety” as opposed to Republican governors, who prioritize economic costs (Baccini and Brodeur, 2020). Countries or states that issued stay-at-home orders had lower infection rates, creating a potential trade-off between public health and short-term economic growth (Baccini & Brodeur, 2020; Aum, Lee, & Shin, 2020). Stay-at-home orders resulted in a 4-percentage-point drop in consumer spending and hours worked (Crucini & O’Flaherty, 2020).

We examine whether there is a relationship between a state's quarterly GDP growth and the gender and political party of the governor by asking two questions. First, did states led by female or Democratic governors have lower GDP growth during the first year of the pandemic? Poorer performance could be due to the trade-off between public health and economic growth. Second, do states led by female or Democratic governors experience lower or higher GDP growth during noncrisis time? Using a state fixed effects model, we test for the effects of both gender and political party as well as their interaction on state GDP growth. We also compare GDP growth for Democrats and Republicans before and during the COVID-19 crisis.

A political leader has power over policies that influence financial and economic decisions in a given region (Easterly & Rebelo, 1993; Jones & Olken, 2005). Evidence suggests that, under certain circumstances, female heads of state can positively affect a country's GDP growth (Perkins et al., 2013). A politician's gender and political party have a distinct effect on their policy priorities. Female and Democratic politicians typically prioritize public health, leading to overall greater population health (Mavisakalyan, 2014; Ng & Muntaner, 2018; Beland & Oloomi, 2017). However, prioritizing lockdowns can lead to lower GDP in the long run (Baccini & Brodeur, 2020; Aum, Lee, & Shin, 2020). Aum, Lee, & Shin (2020) found that lifting lockdown restrictions too early is associated with a temporary rise in GDP but also a rise in infections, leading to another shutdown order.

We find that states led by Democratic governors had an annualized real GDP growth rate 4 points lower than those led by Republican governors during the first half of 2020, suggesting trade-offs between public health and economic growth. Our results show that female governors lowered the GDP growth rate by around 3 percentage points, but the results are weakly significant. A robustness check that controls for potential omitted variable bias with presidential

voting suggests that these results are driven by a governor's party and gender rather than unobservable characteristics associated with potentially voting for Democratic gubernatorial candidates or reduced spending in a pandemic (see Appendix A). We also provide a check for reverse causality showing that GDP growth in an election year is not related to the next elected governor's party or gender (see Appendix B). The results are robust to multiple specifications including using region instead of fixed effects (see Appendix C).

In a back-of-the-envelope calculation (see Appendix D), we find that the value of lower GDP is around two-thirds of the statistical value of lives saved based on differences in deaths that result from the governor's political party. This calculation excludes health care costs and lost wages from additional cases, suggesting that the benefits of risk reduction measures far outweigh the economic costs.

We were unable to detect an effect of gender or political party on GDP growth before 2019 or during the second half of 2020. Gender's effect on growth has been examined at the national level, but we are not aware of any estimates of gender's effect on economic growth at the subnational level. Political party has been investigated extensively at the national level: Many studies have found that Democratic presidents positively affected U.S. GDP, but there are no studies to our knowledge on a governor's political party affecting state GDP (Blinder & Watson, 2016; Cahan & Potrafke, 2017; Hidalgo-Perez, Ferreira & Rubio-Catano, 2018; Chittenden, 2020).

Literature Review

Women's access to leadership roles in national and state politics has been increasing steadily over the past century. Women served as governors as early as the 1920s, but all of these elections were based on their husband's interests or a special election (CAWP, 2021). In 1974, Ella Grasso of Connecticut was the first independently elected female governor. By the 1980s, there were four female governors in office, seven in the 1990s, and 14 in the first decade of the twenty-first century. Progress has stalled in the last decade, with only 13 female governors over the 2010–2020 period (CAWP, 2021). As of early 2022 there are nine female governors: six Democrats and three Republicans.²

Female participation in political leadership positions has been shown to have a significant positive relationship with per capita GDP using country comparisons (Bullough et al., 2012; Jayasuriya & Burke, 2013; Baskaran et al., 2018; Perkins et al., 2013). A positive relationship also exists between per capita GDP and female participation in politics (Bullough et al., 2012). Jayasuriya and Burke (2013) examined 119 democracies, finding that the presence of more female parliamentarians led to faster economic growth. In India, female legislators positively influenced GDP by 1.8 percentage points (Baskaran et al., 2018). Using 50 years of data, Perkins et al. (2013) found no difference in economic growth rates based on a country's leader's gender. However, evidence suggests that female national leaders positively impact economic growth rates during times of ethnic strife, supporting the hypothesis that women may perform better in a crisis (Perkins et al., 2013). In business settings, female board members, directors, or managers

² Trends of US governors are similar to those among world leaders; the first two female national leaders inherited the power. The first female national leader without regency, Sirimavo Bandaranaike, came to power in 1960 over Sri Lanka (Perkins et al., 2013). Worldwide, the 1970s saw six female national leaders, the 1980s had 12 female national leaders, the 1990s had 32 female national leaders, the 2000s 31 female national leaders, and 2010s 68 female national leaders. Female country leaders and U.S. governors have a similar trend due to the almost constant growth in representation. As of 2020, there are 22 female national leaders (CAWP, 2020; Council on Foreign Relations, 2020).

have been shown to increase long-term value, positively affect financial performance, and have results comparable to their male counterparts (Adams & Ferreira, 2009; Strøm et al., 2014; Campbell & Vera, 2010; Marco, 2012; Martinez & Rambaud, 2019). One counter result from Cabalerio-Casal & Buch-Gomez (2020) shows women performing worse than men at a local level. Specifically, they find Spanish cities with a higher percentage of female councilors had worse financial performance. Most empirical work shows that the performance of women in leadership roles is comparable or better than that of their male counterparts.

A leader's political party has been shown to influence different economic measures in the United States. Democratic presidents have performed better than Republican ones, though some evidence suggests it may be due to exogenous shocks or voting patterns (Blinder & Watson, 2016; Cahan & Potrafke, 2017; Hidalgo-Perez & Rubio-Catano, 2018). The U.S. economy is strongest when the president is a Democrat and the Senate and House are controlled by Republicans; however, the U.S. economy is at its weakest when the president is a Republican and the Senate and House are controlled by Democrats (Chittenden, 2020). At the state level, Democratic governors before COVID-19 were more likely to raise taxes, create a larger budget deficit, and experience higher rates of personal income growth (Potrafke, 2018). Relative to Republicans, Democratic governors prioritize education and health/hospitals, with budget differences of +2.4 percentage points to education and +4.9 percentage points to health/hospitals (Beland & Oloomi, 2017).

During the pandemic, there have been distinct differences in the ways in which Democratic governors handled public health. Democratic governors were significantly more likely to implement stay-at-home orders (Baccini and Brodeur, 2020), and all Democratic governors issued and maintained statewide mask mandates. Only 16 of the 27 Republican-led

states issued mask mandates, and five lifted the mask requirement in 2020 (Ballotpedia, 2021). Typically, stronger electoral concerns influence politicians' decisions to adopt "risky policies," and a politician is less likely to reverse their decision. Therefore, an upcoming election is a potential explanation for governors' hesitation to adopt new mask mandates and stay-at-home orders (Bernecker et al., 2021). Baccini and Brodeur (2020) suggested that state-level COVID-19 policy varied by party: "Democratic governors place a special emphasis on health and safety," as opposed to Republican governors, who prioritize economic costs. Democratic governors were 50% more likely than Republican governors to impose stay-at-home orders during the pandemic, leading to a decrease in infection rates for Democratic-led states (Baccini and Brodeur, 2020; Aum, Lee, & Shin, 2020). Aum, Lee, and Shin (2020) find that a relatively long lockdown will eventually lower a country's GDP; this suggests that states led by Democratic governors will typically have lower GDP but also a lower infection rate.

Data Description

The paper uses two datasets: one to measure state-level GDP growth and the other to measure governors' characteristics. Quarterly real GDP growth from the 2nd quarter 2005 through the 4th quarter 2020 for every U.S. state was collected from the Bureau of Economic Analysis (2020). Governors' political parties, time in office, and the majority of gender data were gathered from the National Governors Association (NGA) (Kaplan, 2020). Missing gender data, not provided by the NGA, was manually entered using information from the Center for American Women and Politics (2020). Each of the 3,150 observations represents one fiscal quarter in one state in one year.

The dependent variable is real, seasonally adjusted, quarterly GDP annualized growth by state. The average growth for the sample was 1.55, with a standard deviation of 7.84 (Tables 1 and 2). In 2020, quarterly GDP fell on average by 5.14% in quarter 1 and 31.53% in quarter 2, meeting the commonly used definition of a recession. The economy recovered in the second half of 2020, with GDP increasing by 34.5% in quarter 3 and 4.48% in quarter 4. Comparisons of GDP growth by quarters in 2020 and gender or political party do not show any statistically significant differences with t-tests.

Table 1: Average GDP Growth by Governor's Gender and Party*

	Total	Female	Male	Democratic	Republican or Independent
2005-2020	1.55	1.49	1.56	1.48	1.61
2020 Q1	-5.14	-4.88	-5.16	-5.69	-4.88
2020 Q2	-31.53	-31.66	-31.50	-32.13	-30.98
2020 Q3	34.5	34.46	34.51	34.83	34.19
2020 Q4	4.48	3.90	4.57	3.71	5.18

* t-test comparison by gender or party do not show any statistically significant differences.

Table 2 provides descriptive statistics for all variables. Female governors account for approximately 13% of the total dataset (*Female* = 1). Governors' political party was more evenly

distributed: 44% of governors were Democrats ($DemGov = 1$).³ Roughly 15.5% of Democratic governors and 11.1% of Republican governors were women.

We split the COVID-19 economic crisis into two parts: the economic decline in the first half of 2020 (*CovidRecession*) and the rise in the second half of 2020 (*CovidRecovery*). These two variables comprise 3% of the total dataset. We include the 1st quarter of 2020 in the COVID-19 variable because real GDP for the whole United States fell by 5 percentage points, indicating the start of a recession. Female governors during the COVID-19 recession and COVID-19 recovery comprise 0.40% of the total data ($Fem * CovidRecession = 1$ and $Fem * CovidRecovery = 1$). Democratic governors during the COVID-19 recession and COVID-19 recovery each accounted for 1% of the dataset ($Dem * CovidRecession = 1$ and $Dem * CovidRecovery = 1$); of these, and 7% were female Democratic governors ($Fem * Dem = 1$). We also include controls for the Great Recession of 2007–2009 ($GreatRec = 1$) (4th quarter of 2007 to the 2nd quarter of 2009), a period that comprises 11% of the data; female governors during the Great Recession comprise only 2% of the data ($Fem * GreatRec = 1$). Finally, *ServedYears* measures the number of years served by the governor in the observed year, with an average of 3.24.

³ The three independent governors in our dataset (Crist, Chafee, and Walker) are coded as 0 for Democrat. All three served before the COVID-19 pandemic.

Table 2: Descriptive Statistics

<i>Variable</i>	<i>Mean</i>	<i>SD</i>	<i>Minimum</i>	<i>Maximum</i>
<i>GDP Growth</i>	<i>1.55</i>	<i>7.84</i>	<i>-42.2</i>	<i>58.1</i>
<i>Female</i>	<i>.13</i>	<i>-</i>	<i>0</i>	<i>1</i>
<i>DemGov</i>	<i>.44</i>	<i>-</i>	<i>0</i>	<i>1</i>
<i>CovidRecession</i>	<i>.03</i>	<i>-</i>	<i>0</i>	<i>1</i>
<i>CovidRecovery</i>	<i>.03</i>	<i>-</i>	<i>0</i>	<i>1</i>
<i>Fem*CovidRecession</i>	<i>.004</i>	<i>-</i>	<i>0</i>	<i>1</i>
<i>Dem*CovidRecession</i>	<i>.01</i>	<i>-</i>	<i>0</i>	<i>1</i>
<i>Fem*CovidRecovery</i>	<i>.004</i>	<i>-</i>	<i>0</i>	<i>1</i>
<i>Dem*CovidRecovery</i>	<i>.02</i>	<i>-</i>	<i>0</i>	<i>1</i>
<i>GreatRec</i>	<i>.11</i>	<i>-</i>	<i>0</i>	<i>1</i>
<i>Fem*GreatRec</i>	<i>.02</i>	<i>-</i>	<i>0</i>	<i>1</i>
<i>Dem*GreatRec</i>	<i>.06</i>	<i>-</i>	<i>0</i>	<i>1</i>
<i>Fem*Dem</i>	<i>.07</i>	<i>-</i>	<i>0</i>	<i>1</i>
<i>Quarter</i>	<i>2.52</i>	<i>1.11</i>	<i>1</i>	<i>4</i>
<i>ServedYears</i>	<i>3.2</i>	<i>2.42</i>	<i>0</i>	<i>13</i>

Econometric Model:

The outcome variable in the analysis is a state's GDP quarterly growth rate (annualized and real) in state I , in quarter q , and in year t . The regression in equation (1) tests the effects of gender, political party and COVID-19, with the variables *Female*, *DemGov*, and *Covid* (*CovidRecession*, *CovidRecovery*). All variables are binary variables take a value of 1 when the categorical effect is present, and 0 otherwise.

The two main interaction terms compare female and male governors during economic crises. *Female*CovidRecession* (*Fem*CovidRecession*) gauges the effect on each state of having a female governor and *DemGov*CovidRecession* (*Dem*CovidRecession*) of having a Democrat in office during the COVID-19 recession. We use a parallel variable to measure the recovery difference by governor's gender (*Fem*CovidRecovery*) and party (*Dem*CovidRecovery*). We also include control for the Great Recession (*GreatRec*) its interactions with gender (*Fem*GreatRec*) and party (*Dem*GreatRec*). In a final interaction term, we tested whether female Democrats had different GDP growth than the omitted group male republican governors during periods outside of the great recession or COVID *Female*Demgov* (*Fem*Dem*).

We include state, year, and quarter (seasonal adjustment) fixed effects to control for time-invariant state effects and time-variant country effects. For example time-invariant state fixed effects (*state*) would control for differences between states (e.g., Washington State is home to Amazon's headquarters, which contributes to fast economic growth) (Pulkkinen, 2019). In comparison, Alaska depends heavily on the oil industry, which is struggling to make large profits (Millsap, 2017). Year controls (*year*) are added to account for the health of the U.S. economy in a given year, which is beyond governors' control. Quarter fixed effects (*quarter*) regulate for

seasonal changes in the U.S. economy.⁴ Finally, the years served variable (*ServedYears*) controls for the differences between an experienced and an inexperienced governor. We choose not to use a continuous variable for *ServedYears*, so that we can account for variation during election cycles. That is, governors may prioritize short-term economic growth in election years, which would make the relationship between years served and GDP growth nonlinear.

$$\begin{aligned}
GDPGrowth_{iqt} = & \beta_0 + \beta_1 Female_{iqt} + \beta_2 DemGov_{iqt} + \beta_3 CovidRecession_{iqt} + \\
& + \beta_4 CovidRecovery_{iqt} + \beta_5 Fem * CovidRecession_{iqt} + \beta_6 Dem * CovidRecession_{iqt} + \\
& \beta_7 Fem * CovidRecovery_{iqt} + \beta_8 Dem * CovidRecovery_{iqt} + \beta_9 GreatRec_{iqt} + \\
& \beta_{10} Fem * GreatRec_{iqt} + \beta_{11} Dem * GreatRec_{iqt} + \beta_{12} Fem * Dem_{iqt} + \\
& \alpha_t \sum_{t=2005}^{2020} Year_t + \gamma_i \sum_{i=1}^{49} State + \tau_q \sum_{q=2}^4 Quarter + \tau_s \sum_{q=2}^{13} ServedYears + \varepsilon
\end{aligned}$$

One potential source of endogeneity is omitted variable bias related to a state's voter views. Voters who are more likely to elect women and Democrats may also have been more likely to have stayed home and reduce consumption during the COVID-19 crisis (Bruine de Bruin et al., 2020; Baradaran Motie and Biolsi, 2021). We use the Democratic candidate's vote share in the previous presidential election to address potential concerns about this omitted variable bias. Using presidential vote share controls for state variation in willingness to vote for Democrats and (in the case of Hilary Clinton in 2016) both a woman and a Democrat. In Appendix A, we rerun the standard model with additional controls for previous Democratic

⁴ We elect to include controls for quarters even though GDP data are seasonally adjusted because Lucca and Wright (2021) suggest big shocks that are uncorrelated with standard seasonal growth lead to difficulties in creating seasonal adjustments. The results are not substantially different when we exclude controls for quarters.

presidential vote share and this vote share interacted with COVID-19 recession. The results are robust to the inclusion of these new variables.

A second potential endogeneity concern is reverse causality, where growth affects who is elected. This could bias the results if one type of candidate were elected during recessions, making them look better due to the recovery during a standard business cycle. In terms of the pandemic, we use only data from the first year of the pandemic, so changes in GDP growth could not affect the political party or gender of the governor until 2021. To test for reverse causality, we compare growth rates in election years for states that elected female and male governors; we find no statistically significant difference. (Similar results are found in a comparison of GDP growth in election years for states that elected Democratic and Republican governors.)

We ran six variations and two robustness checks of the model to ensure the results are not sensitive to inclusion or exclusion of additional terms. The first is the full model shown in equation (1). In the second regression, we eliminated the Great Recession (*GreatRec*) variable, the interaction variables (*Fem*GreatRec*, *Dem*GreatRec*), and Democratic COVID-19 interaction variables (*Dem*CovidRecession*, *Dem*CovidRecovery*) to gain an understanding of political party and gender without the great recession and Democratic COVID-19 interactions. In the third, we omitted *Fem*Dem* in addition to the variables dropped in the second regression and leave the *Fem*CovidRecession* and *Fem*CovidRecovery* variables to see the interaction of COVID-19 and party. In the fourth regression, we only tested *Female*, *DemGov*, *Dem*CovidRecession*, and *Dem*CovidRecovery* to isolate the variables for political party effects. The fifth regression included only the party variable and female variable. In the last regression, we included only the female term with the fixed effects. In addition to the main regression, we ran two additional regressions as a robustness check. In the first robustness

regression, we dropped the year served variable; for the second, we changed the state fixed effects to regional fixed effects. Our results are robust to these two additional specifications (see Appendix C for more details).

Results

We find that states led by female governors during the COVID-19 recession experienced GDP growth that was 3 percentage points lower than experienced by states led by male governors; in states led by Democratic governors, GDP growth was roughly 4 percentage points lower during the pandemic. *Ceteris paribus*, the statistical significance is stronger for party effects. This result suggests that there are short-term negative economic effects to the public health measures more typically implemented by female and Democratic governors. States led by female and Democratic governors did not experience stronger economic recovery after the COVID-19 recession. Overall, we do not find a governor's gender or party to have had an effect on GDP growth in the second half of 2020.

During the COVID-19 recession, states led by female governors (*Fem*CovidRecession*) experienced GDP growth around 2.1 percentage points lower than those led by male governors, but the difference was not statistically significant, and the confidence interval spans from -5.14 to 0.97 (Table 3). However, in models 2 and 3 we find weakly significant results suggesting that having a female governor is correlated with lowering a state's GDP growth by 3 percentage points. There are no results that indicate that states led by female governors had a stronger economic recovery after the COVID-19 recession (*Fem*CovidRecovery*).

Prepandemic, we found no strong evidence of difference in gender (*Female*). The coefficients range from 0.01 to 0.66 and confidence interval of GDP growth is between -0.80 and

1.59. Given the relatively large variation and differing coefficients, we do not find evidence that states with female governors statistically performed worse or better than those with male leaders outside of the COVID-19 recession.

States with Democratic governors during the COVID-19 pandemic (*Dem*CovidRecession*) had a growth rate over 4 percentage points lower on an annualized basis, which was statistically significant in models 1 and 4. With a confidence interval of -6.61 to -1.60 on GDP growth, it is quite clear that Democratic governors during the COVID-19 crisis were more focused on improving public health, which may have negatively affected economic growth. This result suggests that COVID-19 prevention measures had negative short-term impacts. There were no observed differences by party in terms of recovery.

During noncrisis times, states with female, Democratic governors (*Fem*Dem*) perform slightly worse—around -1.01 percentage points, with a confidence interval of -2.3 to 0.28, which is not statistically significant—in terms of GDP growth. Individually, neither women nor Democrats seem to oversee economies that perform better or worse than men or Republicans (*DemGov, Female*). Seeing only the negative effect of the interaction suggests that female Democratic governors' policy differences compared to other governors may promote equity overgrowth, as the literature suggested.

The other major economic crisis that the United States experienced during the period of study was the Great Recession. We found that female and male governors seemed to have performed equally during that time. Both the coefficients attached to the female Great Recession (*Fem*GreatRec*) and the Democratic Great Recession (*Dem*GreatRec*) variables are very small and statistically insignificant. The small coefficient and relatively small range of variation give

us more confidence to say that female and male governors preformed equally during the previous crisis.

Table 3: Gender, Political Party, COVID-19 Impacts on Quarterly GDP Growth

VARIABLES	(1) GDPgrowth	(2) GDPgrowth	(3) GDPgrowth	(4) GDPgrowth	(5) GDPgrowth	(6) GDPgrowth
Female	0.662 (0.476)	0.635 (0.470)	0.102 (0.336)	-0.0207 (0.320)	-0.0126 (0.406)	-0.0110 (0.405)
DemGov	0.237 (0.260)	0.0829 (0.242)	-0.0627 (0.225)	0.0656 (0.227)	0.0204 (0.280)	
CovidRecession	-20.82*** (1.029)	-22.41*** (0.900)	-22.39*** (0.900)	-21.01*** (1.015)		
CovidRecovery	16.68*** (1.022)	16.51*** (0.859)	16.54*** (0.860)	16.52*** (1.010)		
Fem*CovidRecession	-2.125 (1.853)	-3.017* (1.826)	-3.110* (1.825)			
Dem*CovidRecession	-4.106*** (1.279)			-4.315*** (1.260)		
Fem*CovidRecovery	-1.358 (1.768)	-1.302 (1.728)	-1.509 (1.723)			
Dem*CovidRecovery	-0.227 (1.259)			-0.412 (1.229)		
GreatRec	-1.412* (0.766)					
Fem*GreatRec	-0.476 (0.950)					
Dem*GreatRec	-0.266 (0.695)					
Fem*Dem	-1.017 (0.655)	-1.078 (0.658)				
Constant	3.419*** (0.571)	3.476*** (0.571)	3.509*** (0.570)	3.458*** (0.569)	2.190*** (0.720)	2.199*** (0.710)
Observations	3,150	3,150	3,150	3,150	3,150	3,150

Standard errors in parentheses
 *** p<0.01, ** p<0.05, * p<0.1

Note: Errors are clustered at the state level. State, Year, Years Served, and Quarter fixed effects are included but omitted due to space constraints

Conclusion

We find that states with Democratic governors experienced deeper recessions during the COVID-19 pandemic; we find weaker evidence that states with female leaders did as well. When combined with other studies showing that female and Democratic governors implemented policies that led to fewer COVID-related deaths, our results suggest a trade-off between social distancing and economic growth. A back-of-the-envelope cost-benefit calculation (Appendix D) suggests that the roughly 2-point annual reduction in economic growth found in this study is less than the statistical value of Neelon et al. (2020) estimate of the 60,000 lives saved by Democratic governors through public health policies.

One limitation to this work is that the dataset is limited by only having a sample size of 50 states throughout the years and the type of women elected. Clearly, any future study of female subnational leadership in the United States will be constrained by the number of states. However, the number of female governors will continue to increase, allowing for a larger sample size. The data are also limited in how we can examine female leaders' handling of economic crises. Each year passes creates an additional 200 observations, meaning the analysis will become more accurate for female governors' impact on state GDP. These data have only two major economic crises to compare, but as the U.S. economy experiences more economic cycles there will be more economic recessions to analyze. As more female leaders are welcomed into national and subnational politics, more research can study the effects of female leadership.

Prior to the COVID-19 pandemic, female and Democratic governors performed equally well relative to their male and Republican counterparts, suggesting that no gender or political party is better at running a state's economy. The cost-benefit comparison favors female and Democratic governors in terms of their handling of COVID-19, though it relies on assumptions

about the statistical value of lives and the number of lives saved. Future work may examine the next crisis or address the impact of women and Democrats at a more local level in terms of school boards and mayors, who may also affect both health and economic outcomes.

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Appendix A: Omitted Variables and Presidential Share Regression

One potential concern with our approach is omitted variable bias caused by unobservable factors that are related to both the likelihood of electing a Democratic governor and the effect of COVID-19 on the economy. As a robustness check to address this bias, we control for the percentage of the vote the Democratic presidential candidate received in the previous election in the state of interest. Voting share could bias the results in both directions. On the one hand, voters who identify as Democrats may have been more able to switch to remote work, causing less of a drag on state's economy; this would bias the results toward zero. On the other hand, Democratic voters could reflect attitudes associated with self-enforced social distancing, which caused a deeper recession, biasing the results toward larger negative effects of Democratic governors.

Our results are extremely consistent with those that do not include this control, which suggests that the omitted variable bias is less of potential threat. The positive and weakly significant coefficient on the interaction of Democratic presidential vote share (*DemPresShare*) and COVID-19 suggests that more Democratic voters bias our estimates toward zero. This is consistent with the potential mechanism where Democratic voters may be more able to work remotely, preventing heavily Democratic states from falling into as deep a recession as those with more non-Democratic voters. The results without omitted variable controls make Democratic governors' decline smaller without this control, though the difference is relatively small. We see even smaller effects for the estimate on female governors.

Appendix A: Regression with Controls for Presidential Voting Share

VARIABLES	(1) GDPgrowth	(2) GDPgrowth	(3) GDPgrowth	(4) GDPgrowth	(5) GDPgrowth	(6) GDPgrowth
DemPresShare	-0.198 (1.878)	0.0175 (1.879)	0.270 (1.870)	0.578 (1.854)	-0.480 (2.354)	3.330* (1.801)
DemPresCovidRecession	11.69* (6.949)	-0.712 (6.085)	-0.914 (6.084)			-80.19*** (1.997)
Female	0.588 (0.512)	0.493 (0.499)	0.0130 (0.352)	-0.110 (0.340)	-0.122 (0.432)	-0.202 (0.350)
DemGov	0.267 (0.283)	0.109 (0.264)	-0.0229 (0.245)	0.0894 (0.250)	0.112 (0.311)	
CovidRecession	-25.40*** (2.951)	-22.06*** (2.814)	-21.95*** (2.813)	-20.92*** (1.015)		
CovidRecovery	16.71*** (1.022)	16.51*** (0.860)	16.54*** (0.860)	16.53*** (1.011)		
Fem*CovidRecession	-1.777 (1.862)	-3.039* (1.824)	-3.102* (1.824)			
Dem*CovidRecession	-5.385*** (1.464)			-4.416*** (1.260)		
Fem*CovidRecovery	-1.424 (1.769)	-1.346 (1.727)	-1.487 (1.724)			
Dem*CovidRecovery	-0.232 (1.259)			-0.429 (1.229)		
GreatRec	-1.477* (0.766)					
Fem*GreatRec	-0.632 (0.954)					
Dem*GreatRec	-0.103 (0.701)					
Fem*Dem	-0.911 (0.671)	-0.909 (0.670)				
Constant	3.362*** (1.289)	3.343*** (1.291)	3.202** (1.287)	3.001** (1.282)	2.270 (1.627)	1.718 (1.286)
Observations	3,150	3,150	3,150	3,150	3,150	3,150
R-squared	0.425	0.421	0.420	0.422	0.065	0.384

Standard errors in parentheses

Controls for region, year, quarter and the number of years served by the governor are included in the estimation by excluded from the table above for readability

*** p<0.01, ** p<0.05, * p<0.1

Appendix B: Reverse Causality Test

Table A1: GDP Growth in Year Before Election by Governor's Gender and Party

	No	Yes	Mean Growth No	Mean Growth Yes	dif	St Err	t value	p value
Female Governor	161	33	2.045	2.367	-.322	.571	-.55	.574
Democratic Governor	94	100	2.28	1.931	.35	.428	.8	.416

We tested for reverse causality to see whether a state's economic growth affects whether people vote for Democratic or female governors. Of the 194 elections in the sample period, females were elected 33 times and Democrats 100 times. We perform a simple t-test on GDP growth in the election year and find that differences are small and not statistically different from zero.

States that elect men or Democrats grew roughly 0.3 slower on an annualized rate, which was not statistically significant. We find there is no strong relationship between the strength of a state's economy and whether voters will elect a Democratic or female governor, which is suggestive of a lack of reverse causality.

Appendix C: Robustness check of model selection

We performed two robustness checks to confirm our original regression and found the results to be congruent. We ran a regression without the *ServedYears* variable in Appendix Table C1. The results are very similar to our main regression with a few tiny differences. Most notably, the *Dem*CovidRecession* decreases almost a full percentage point, from about -4 to -5 in both model 1 and model 4. *Fem*CovidRecession* also decreases 0.2–0.3 percentage points in models 2 and 3. Other than these changes, the model is consistent with our earlier findings.

The last regression, Appendix Table C2, we changed state fixed effects to regional fixed effects. The *Dem*CovidRecession* variable was more comparable to the main regression, with a less than 0.1 decrease in models 1 and 4. The *Fem*CovidRecession* variable is almost identical to that in our main model. Overall, the two additional regressions support the findings of the original regression model.

Appendix C1: Results without including served years variable

VARIABLES	(1) GDPgrowth	(2) GDPgrowth	(3) GDPgrowth	(4) GDPgrowth	(5) GDPgrowth	(6) GDPgrowth
Female	0.637 (0.495)	0.610 (0.485)	0.0646 (0.347)	-0.0682 (0.333)	-0.00673 (0.405)	-0.00500 (0.405)
DemGov	0.225 (0.269)	0.0343 (0.250)	-0.112 (0.233)	0.0457 (0.238)	0.0206 (0.278)	
CovidRecession	-19.24*** (0.956)	-21.07*** (0.832)	-21.05*** (0.832)	-19.39*** (0.942)		
CovidRecovery	16.80*** (0.991)	16.66*** (0.827)	16.69*** (0.827)	16.65*** (0.981)		
Fem*CovidRecession	-2.095 (1.859)	-3.245* (1.833)	-3.336* (1.833)			
Dem*CovidRecession	-4.991*** (1.274)			-5.198*** (1.255)		
Fem*CovidRecovery	-1.335 (1.776)	-1.304 (1.736)	-1.504 (1.732)			
Dem*CovidRecovery	-0.225 (1.260)			-0.398 (1.231)		
GreatRec	-1.491* (0.769)					
Fem*GreatRec	-0.346 (0.957)					
Dem*GreatRec	-0.234 (0.700)					
Fem*Dem	-1.074 (0.677)	-1.090 (0.676)				
Constant	3.642*** (0.574)	3.727*** (0.573)	3.763*** (0.573)	3.687*** (0.572)	2.038*** (0.715)	2.047*** (0.705)
Observations	3,150	3,150	3,150	3,150	3,150	3,150

*** p<0.01, ** p<0.05, * p<0.1

Note: Errors are clustered at the state level. State, Year, Years Served, and Quarter fixed effects are included but omitted due to space constraints

Appendix C2: Results using region controls

VARIABLES	(1) GDPgrowth	(2) GDPgrowth	(3) GDPgrowth	(4) GDPgrowth	(5) GDPgrowth	(6) GDPgrowth
Female	0.569 (0.512)	0.494 (0.499)	0.0117 (0.352)	-0.116 (0.340)	-0.117 (0.432)	-0.109 (0.431)
DemGov	0.246 (0.267)	0.109 (0.247)	-0.0129 (0.231)	0.114 (0.237)	0.0904 (0.293)	
CovidRecession	-20.75*** (1.028)	-22.37*** (0.899)	-22.36*** (0.899)	-20.93*** (1.014)		
CovidRecovery	16.68*** (1.021)	16.52*** (0.859)	16.53*** (0.859)	16.51*** (1.009)		
Fem*CovidRecession	-2.131 (1.851)	-3.035* (1.823)	-3.102* (1.823)			
Dem*CovidRecession	-4.184*** (1.279)			-4.403*** (1.259)		
Fem*CovidRecovery	-1.409 (1.768)	-1.346 (1.726)	-1.494 (1.723)			
Dem*CovidRecovery	-0.233 (1.258)			-0.415 (1.228)		
GreatRec	-1.481* (0.766)					
Fem*GreatRec	-0.640 (0.954)					
Dem*GreatRec	-0.0944 (0.700)					
Fem*Dem	-0.888 (0.668)	-0.911 (0.667)				
SouthEast	-0.234 (0.795)	-0.224 (0.797)	-0.170 (0.796)	-0.171 (0.795)	-0.267 (1.011)	-0.234 (1.005)
SouthWest	0.395 (0.873)	0.438 (0.873)	0.615 (0.864)	0.608 (0.862)	0.722 (1.096)	0.746 (1.093)
GreatLakes	-0.367 (0.834)	-0.366 (0.835)	-0.359 (0.835)	-0.367 (0.834)	-0.407 (1.060)	-0.372 (1.054)
NewEngland	-0.427 (0.829)	-0.401 (0.831)	-0.341 (0.830)	-0.364 (0.829)	-0.446 (1.053)	-0.396 (1.041)
RockyMountains	0.629 (0.838)	0.624 (0.840)	0.687 (0.839)	0.700 (0.838)	0.880 (1.065)	0.922 (1.056)
FarWest	0.687 (0.831)	0.646 (0.832)	0.698 (0.831)	0.750 (0.830)	0.625 (1.055)	0.673 (1.044)

Plains	0.704 (0.811)	0.709 (0.813)	0.731 (0.813)	0.707 (0.812)	0.703 (1.032)	0.730 (1.028)
MidEast	-0.102 (0.846)	-0.130 (0.847)	-0.0677 (0.846)	-0.0306 (0.845)	-0.165 (1.074)	-0.100 (1.053)
Constant	3.297*** (0.934)	3.351*** (0.933)	3.329*** (0.933)	3.276*** (0.932)	2.043* (1.184)	2.044* (1.184)
Observations	3,150	3,150	3,150	3,150	3,150	3,150
R-squared	0.424	0.421	0.420	0.422	0.065	0.065

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Note: Errors are clustered at the regions. Region, Year, Years Served, and Quarter fixed effects are included but omitted due to space constraints

Appendix D: Back of the Envelope Cost Benefit

We estimate that Democratic governors had an annualized decline in GDP of 4 percentage points more than Republican governors during the first two quarters of 2020. The U.S. economy is worth approximately \$20 trillion, so a 2% decrease would represent a loss of \$400 billion, which represents a crude approximation of costs. Benefits can be estimated based on lives saved. In environmental and health policy fields, a statistical economic life is on average assumed to be worth \$10 million dollars (Cutler and Summers, 2020). To overcome the 2% drop in GDP, over 40,000 lives would need to be saved. As of December 31, 2020, around 352,000 people had died from COVID-19 (John Hopkins, 2021). We consider the 3rd and 4th quarters given that people may not present symptoms for up to 13 days after infection (Harvard Health Publishing, 2021); symptoms of long-haul COVID-19 patients can last for up to six months (Ellis & Goodman, 2021), and higher infection rates in the 2nd quarter can lead to more deaths in the 3rd and 4th quarter.

Neelon et al. (2020) estimate that states with Republican governors experienced 18% more deaths. If all governors were Republicans, the United States would have experienced 63,393 more deaths than if all were democrats by this estimate (Neelon et al., 2020). The statistical costs of deaths are close to 1.5 times more than the economic costs measured by GDP. One counter is that reduced GDP may increase mortality as households have less money to spend on health care. Estimates from Broughel and Viscusi (2021) suggest a rule-of-thumb relationship of a \$100 million reduction equivalent to one life. Using this rule of thumb, roughly 4,000 additional deaths from the two-percentage-point reduction in Democratic states are equivalent to U.S. GDP of roughly 20 trillion dollars. Even with this adjustment, the estimates of Neelon et al. still outweigh the statistical value of lives by a factor of roughly 1.5.

The gap between public health benefits and economic costs increases even more when hospitalizations (estimated to cost \$30,000 on average per hospitalized COVID-19 patient) are included (Hackett, 2020; O'Brien, 2020). Considering lost work, negative impacts on long-term health, and the cost of hospitalizations means that the economic impacts favor Democratic governors even further.